UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/604,051	06/24/2003	William A. Enichen	FIS920030067	1050

23550 7590 12/28/2004

HOFFMAN WARNICK & D'ALESSANDRO, LLC
3 E-COMM SQUARE
ALBANY, NY 12207

EXAMINER	
LE, JOHN H	

ART UNIT	PAPER NUMBER
2863	

DATE MAILED: 12/28/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	10/604,051	ENICHEN ET AL.	
	Examiner	Art Unit	
	John H Le	2863	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *03 December 2004*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *11-23* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☒ Claim(s) *22 and 23* is/are allowed.

6)☒ Claim(s) *11-16 and 18-20* is/are rejected.

7)☒ Claim(s) *17 and 21* is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *24 June 2003* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

Election/Restrictions

1. Applicant's election of group II (Claims 11-23) in Paper mail on 12/03/2004 with traverse is acknowledged. Accordingly, claims 1-10 are withdrawn from consideration as being directed to a non-elected invention. See 37 CFR 1.142(b) and MPEP § 821.03. Applicant has the right to file a divisional application covering the subject matter of the non-elected claims 1-10.

2. Applicant's election with traverse of group II (Claims 11-23) in Paper mail on 12/03/2004 is acknowledged. Because applicant did not distinctly and specifically point out the supposed errors in the restriction requirement, the election has been treated as an election without traverse (MPEP § 818.03(a)).

Claim Rejections - 35 USC § 103

3. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

4. Claims 11-16 and 20 are rejected under 35 U.S.C. 103(a) as obvious over Imai (USP 6,737,207).

Regarding claim 11, Imai disclose a method of evaluating image quality of an electron beam lithography tool (Col.2, lines 40-59), the method comprising the steps of: generating a test array of test pattern cell (test substrate, plurality of compared area on the substrate) exposures at at least one sub-field test position in an exposure field (Figs. 3A-3C, Col.2, lines 65-67, Col.3, lines 14-21, Col.6, lines 15-21), wherein each test

pattern cell exposure within a given test array occurs under a different set of lithography tool test corrections (e.g. (Figs. 3A-3C, Col.15, lines 26-57); and evaluating image quality based on the test arrays (e.g. Col.6, lines 15-21).

Regarding claim 12, Imai disclose each test pattern cell exposure has a corresponding exposure in each test array that occurs under the same set of lithography tool test corrections (e.g. (Figs. 3A-3C).

Regarding claim 13, Imai disclose steps of: repeatedly exposing the test pattern cell at each sub-field test position on a resist coated substrate (e.g. Abstract, Col.20, lines 34-65); shifting the resist coated substrate (e.g. Col.21, lines 50-57) a predetermined distance between each exposure to generate the test array at each sub-field test position; and developing the resist coated substrate to generate the test array at each sub-field test position (e.g. Col.24, lines 44-60).

Regarding claim 14, Imai disclose shifting includes shifting in both a first direction and a second direction within a single plane (e.g. Col.22, lines 21-29).

Regarding claim 15, Imai disclose steps of: determining which exposure within each test array provides a highest image quality (e.g. Col.7, lines 10-39) and recording a test correction for that exposure for each sub-field test position (e.g. Col.12, lines 1-12).

Regarding claim 16, Imai disclose steps of: applying a tool correction for a selected sub-field position within the exposure field based on recorded test corrections for the sub-field test positions (e.g. Col.12, lines 1-12).

Regarding claim 20, Imai disclose computer (27) configured to determine a tool correction for a selected sub-field position within an exposure field based on recorded test corrections for at least one sub-field test positions (e.g. Col.17, line 49-Col.18, line 24, Col.21, lines 22-65).

Imai discloses the claimed invention except for at least thirteen sub-field test positions in an exposure field. It would have been obvious to one having ordinary skill in the art at the time the invention was made to inform thirteen sub-field test positions in an exposure field since Imai discloses at least one sub-field test position in an exposure field (Figs. 3A-3C, Col.2, lines 65-67, Col.3, lines 14-21, Col.6, lines 15-21). It has been held that where the general conditions of a claim are disclosed in the prior art, discovering the optimum or working ranges involves only routine skill in the art. In re Aller, 105 USPQ 233.

5. Claim 18 is rejected under 35 U.S.C. 103(a) as being unpatentable over Imai (USP 6,737,207) in view of Lo et al. (USP 6,344,750).

Regarding claim 18, Imai fail to disclose the evaluating step is conducted for at least one of a focus correction, an in-axis astigmatism correction, and an off-axis astigmatism correction.

Lo et al. disclose the evaluating step is conducted for at least one of a focus correction, an in-axis astigmatism correction, and an off-axis astigmatism correction (e.g. Col.8, lines 26-30).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to inform the evaluating step is conducted for at least one of a

focus correction as taught by Lo et al. in a method of evaluating image quality of an electron beam lithography tool of Imai for purpose of providing a method for detecting defects in a patterned substrate by inspection with a charged particle beam inspection tool which generates an image of a portion of the patterned substrate and compares the image with a reference in order to identify any defects in the patterned substrate (Lo et al., Abstract).

6. Claim 19 is rejected under 35 U.S.C. 103(a) as being unpatentable over Imai (USP 6,737,207) in view of Adel et al. (US 2003/0021466 A1)).

Regarding claim 19, Imai fails to disclose the test pattern cell includes: a set of at least three elongated spaces, each elongated space having a different width than other elongated spaces in the set; and at least one box-in-box pattern.

Adel et al. disclose the test pattern cell includes: a set of at least three elongated spaces, each elongated space having a different width than other elongated spaces in the set (e.g. [0065]-[0066]); and at least one box-in-box pattern (Figs.12-13).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to include a set of at least three elongated spaces, each elongated space having a different width than other elongated spaces in the set; and at least one box-in-box pattern as taught by Adel et al. in a method of evaluating image quality of an electron beam lithography tool of Imai for purpose of providing an overlay mark for determining the relative shift between two or more successive layers of a substrate via scanning (Adel et al., Abstract).

Allowable Subject Matter

7. Claims 22 and 23 are allowed.

8. Claims 17, 21 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

The following is a statement of reasons for the indication of allowable subject matter:

Regarding claim 17, none of the prior art of record teaches or suggests the combination of a method of evaluating image quality of an electron beam lithography tool, wherein the method comprising the steps of: generating a test array of test pattern cell exposures at at least thirteen sub-field test positions in an exposure field, wherein each test pattern cell exposure within a given test array occurs under a different set of lithography tool test corrections; evaluating image quality based on the test arrays, wherein the evaluating step includes: determining which exposure within each test array provides a highest image quality and recording a test correction for that exposure for each sub-field test position; applying a tool correction for a selected sub-field position within the exposure field based on recorded test corrections for the sub-field test positions, wherein the step of applying a tool correction includes: implementing a two-dimensional, third-order polynomial equation for each recorded test correction; calculating a set of correction coefficients for each two-dimensional, third-order polynomial equation; and applying the set of correction coefficients to determine the tool correction for the selected sub-field position. It is these limitations as they are claimed in

the combination with other limitations of claim, which have not been found, taught or suggested in the prior art of record, that make these claims allowable over the prior art.

Regarding claim 21, none of the prior art of record teaches or suggests the combination of a computer program product comprising a computer useable medium having computer readable program code embodied therein for correcting a lithography tool, wherein the program product comprising: program code configured to determine a tool correction for a selected sub-field position within an exposure field based on recorded test corrections for at least thirteen sub-field test positions, wherein the determining program code: implements a two-dimensional, third-order polynomial equation for each recorded test correction; calculates a set of correction coefficients for each two-dimensional, third-order polynomial equation; and applies the set of correction coefficients to determine the tool correction for the selected sub-field position. It is these limitations as they are claimed in the combination with other limitations of claim, which have not been found, taught or suggested in the prior art of record, that make these claims allowable over the prior art.

Regarding claim 22, none of the prior art of record teaches or suggests the combination of a computer-readable storage medium having stored therein instructions for performing a method, wherein the method comprising the steps of: determining a lithography tool correction for a selected sub-field position within an exposure field of the lithography tool based on recorded test corrections for at least thirteen sub-field test positions including: implementing a two-dimensional, third-order polynomial equation for each recorded test correction; calculating a set of correction coefficients for each two-

dimensional, third-order polynomial equation; and applying the set of correction coefficients to determine the lithography tool correction for the selected sub-field position. It is these limitations as they are claimed in the combination with other limitations of claim, which have not been found, taught or suggested in the prior art of record, that make these claims allowable over the prior art.

Regarding claim 23, none of the prior art of record teaches or suggests the combination of a system for optimizing lithography tool image quality, wherein the system comprising: means for determining a tool correction for a selected sub-field position within an exposure field of a lithography tool based on recorded test corrections for at least thirteen sub-field test positions, the determining means including: means for implementing a two-dimensional, third-order polynomial equation for each recorded test correction; means for calculating a set of correction coefficients for each two-dimensional, third-order polynomial equation; and means for applying the set of correction coefficients to determine the tool correction for the selected sub-field position. It is these limitations as they are claimed in the combination with other limitations of claim, which have not been found, taught or suggested in the prior art of record, that make these claims allowable over the prior art.

Contact Information

9. Any inquiry concerning this communication or earlier communications from the examiner should be directed to John H Le whose telephone number is 571-272-2275. The examiner can normally be reached on 8:00 - 4:30.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, John E Barlow can be reached on 571-272-2269. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

John H. Le

Patent Examiner-Group 2863

December 20, 2004

John Barlow
Supervisory Patent Examiner
Technology Center 2800